English Translation of Amendments under PCT Article 19 filed on October 20, 2004

 

CLAIMS:

1. (Amended) A visible-light-responsive three-dimensional fine cell-structured photocatalytic filter, being characterized by including a sponge-like porous structure (B) containing an anatase-type titanium oxide coating formed on a surface of a sponge-like porous structural body (A) which has a porosity of 85 vol% or more,

said sponge-like porous structural body (A) being composed of one material selected from the group consisting of (a) to (e):

(a) carbon and either or both of silicon and a silicon alloy;

(b) silicon carbide and at least one material selected from the group consisting of silicon, a silicon alloy, and carbon;

(c) silicon nitride and at least one material selected from the group consisting of silicon, a silicon alloy, carbon, and silicon carbide;

(d) amorphous carbon; and

(e) carbon and one metal selected from the group consisting of titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, ruthenium, rhodium, palladium, silver, platinum, and gold.

2. The visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of claim 1, wherein:

said sponge-like porous structural body (A) contains a carbon and either or both of silicon and a silicon alloy; and

said sponge-like porous structure (B) has a sponge-like base structure with crosslinks which have an average thickness of 1 mm or less and contains silicon and carbon in a Si/C molar ratio of 0.1 to 2.

14. (Amended) A visible-light-responsive three-dimensional fine cell-structured photocatalytic filter, being characterized in that said filter has a sponge-like porous structure (B) having a surface on which a titanium oxide coating is provided,

wherein said sponge-like porous structure (B) is prepared by: immersing, in a solution containing or generating titanium oxide, a sponge-like porous structural body (A) containing amorphous carbon and having a porosity of 85 vol% or more; drying said immersed structural body (A); and thereafter firing said dried structural body (A) at 100°C to 500°C in an oxidizing atmosphere.

15. (Amended) The visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of claim 14, wherein said sponge-like porous structural body (A) is composed of amorphous carbon.

16. A visible-light-responsive three-dimensional fine cell-structured photocatalytic filter, being characterized in that said filter has a sponge-like porous structure (B) having a surface on which a titanium oxide coating is provided,

wherein said sponge-like porous structure (B) is prepared by: immersing, in a solution containing or generating titanium oxide, a sponge-like porous structural body (A) containing carbon and one metal selected from the group consisting of titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, ruthenium, rhodium, palladium, silver, platinum, and gold and having a porosity of 85 vol% or more; drying said immersed structural body (A); and thereafter firing said dried structural body (A) at 100 ° C to 500°C in an oxidizing atmosphere.

17. The visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of claim 16, wherein:

said sponge-like porous structural body (A) is composed of carbon and titanium.

18. The visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of claim 17, wherein said sponge-like porous structure (B) has a sponge-like base structure with crosslinks which have an average thickness of 1 mm or less and contains titanium and carbon in a Ti/C molar ratio of 0.1 to 2.

19. (Amended) The visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of any one of claims 1, 5, 8, 11, and 16, wherein the carbon is amorphous carbon.

20. A purifier device, being characterized by comprising the visible-light-responsive three-dimensional fine cell-structured photocatalytic filter of any one of claims 1 to 19.

21. The purifier device of claim 20, comprising:

a container having a fluid inlet and a fluid outlet on opposite sides and an external optically transparent area allowing visible and/or ultraviolet light to pass therethrough; and

a photocatalytic filter provided inside the container,

wherein the photocatalytic filter purifies fluid coming in through the fluid inlet by visible and/or ultraviolet light received through the optically transparent area and discharges the purified fluid through the fluid outlet,

said purifier device being capable of functioning under visible light,

wherein the photocatalytic filter contains a filter unit

silicon powder and a silicon alloy, said initial structural body (C) containing either a polymer compound or a natural fiber, thread or paper with a sponge-like base structure;

thereafter heating said impregnated initial structural body (C) at 800°C to 1500°C in a nitrogen atmosphere so as to carbonize said impregnated initial structural body (C) and to subject the silicon to a nitriding reaction.

39. The method of either one of claims 37 and 38, wherein:

the sponge-like base structure of said initial structural body (C) has crosslinks having an average thickness of 1 mm or less; and

said sponge-like porous structural body (A) is formed with said initial structural body (C) preserving a shape thereof, using silicon powder and/or a silicon alloy containing silicon and carbon in a Si/C molar ratio of 0.1 to 2.

40. (Amended) A method of manufacturing a visible-light-responsive three-dimensional fine cell-structured photocatalytic filter, being characterized by the sequential steps of:

immersing, in a solution containing or generating titanium oxide, a sponge-like porous structural body (A) containing amorphous carbon and having a porosity of 85 vol% or more;

drying said immersed structural body (A); and

firing said dried structural body (A) at 100°C to 500°C in an oxidizing atmosphere.

41. (Amended) The method of claim 40, wherein said sponge-like porous structural body (A) is composed of amorphous carbon.

42. The method of either one of claims 40 and 41, wherein after an initial structural body (C) having a sponge-like base